DOCUMENT RESUME

ED 206 043 EA 013 760

AUTHOR Uguroglu, Margaret E.; Walberg, Herbert J.
TITLE Motivation and Achievement: A Quantitative Synthesis.
INSTITUTION Illinois Univ., Chicago. Chicago Circle Campus.
SPONS AGENCY National Inst. of Education (DHEW), Washington, D.C.
PUB DATE 79
GRANT NIE-678-0090
NOTE 44p.; Paper presented at the Annual Meeting of the American Educational Research Association (San Francisco, CA, April 8-12, 1979). This document is Part E of a compilation entitled "Generalized Theory of Design and Analysis of Educational-Effectiveness Research." For related documents, see EA 013 759-761, EA 013 763-767, ED 168 714, ED 185 064, and EJ 210 984.

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Academic Achievement; Elementary Secondary Education; Instructional Program Divisions; *Learning Motivation; Locus of Control; Predictor Variables; Self Concept; *Student Motivation; Tables (Data)

ABSTRACT

Using analysis of variance and regression techniques, the authors analyzed the results of 40 studies that were conducted between 1953 and 1976 and contained 232 correlations between various measures of motivation and achievement. The motivation variables were restricted to students' achievement motivation, locus-of-control perceptions, and general as well as academic and mathematics self-concepts. Academic achievement was measured by ability or achievement tests or by grade point indices. The student characteristics studied included sex, grade level, and U.S. or non-U.S. location. The results indicated that motivation accounted for an average of 11.4 percent of the variation in academic achievement in the studies. Variation in the size of the 232 correlations resulted from the interaction among eight variables, including the nature of each study, the motivation or achievement measure used, and the grade level studied. Grade level, in fact, emerged as the only significant student characteristic, as students' achievement and motivation scores were more highly correlated in the later grades. (Author/RW)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

✓ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

ED206043

Motivation and Achievement: A Quantitative Synthesis

Margaret E. Uguroglu and Herbert J. Walberg

University of Illinois at Chicago Circle

EA 013 760

AERA Presentation, 1979

Abstract

To estimate the typical correlation between motivation and educational achievement, the correlations from a calibration sample of 22 studies, and a validation sample of 18 studies, were analyzed using analysis of variance and regression techniques. Motivation factors were restricted to general, academic or math self-concept, locus of control and achievement motivation; achievement outcome measures included achievement and ability tests and grade point indices. For grades 1-12, 232 uncorrected observed correlations showed a mean of .338 indicating 11.4 percent of the variance accounted for in achievement by motivation. Eight variables in a regression model accounted for 39 percent of the variance in the magnitude of the correlations. Grade level emerged as the only significant student characteristic; motivation and achievement are more highly correlated in students in later grades.

Motivation and Achievement: A Quantitative Synthesis[1]

What is the typical correlation between measures of motivation and educational achievement? One recent review, discussed below, suggests a figure of approximately .50. But it is by no means clear that this figure would be estimated from a second sample of studies; and it remains to be shown whether certain motivation constructs such as locus of control are more valid than others, as claimed by some authors, or that the relation of motivation and achievement is stronger for some students, for example, boys or girls or older or younger samples, as held by others. The purpose of this review is to use new analytic techniques for synthesizing research to produce objective estimates of the motivation-achievement correlation and to examine its dependency on types of motivation, achievement, and samples that have been investigated in recent years.

Theoretical Background

Plato and Aristotle pointed out in their educational writings the need for awakening the child's interest in the subject and inducing motivation to learn. It might be said today, however, that motivation in the classic psychic triad is unduly neglected in psychology's slow but pervasive shift from behaviorism to cognition. Even so, motivation, since the founding of modern American psychology at the turn of the century, has played an interesting and varied role in the study of learning.

One of the earliest positions may be novel to research workers who

are familiar only with current theories: contrary to the widespread current view that motivation is causally prior to behavior and thought, James and Lange held that behavior causes emotion and cognition (Deci, 1975); for example, the act of running from a danger causes panic and fright. Since the James-Lange theory of emotion, psychologists have taken a variety of theoretical positions. These may be grouped into four categories: 1) associative theories that emphasize the links of motivational constructs to cues and reinforcements; 2) psychoanalytic theories that, following Freud, feature emotions as primary causes of thought and behavior; 3) humanistic theories that place value on fulfillment of human needs for autonomy and satisfaction as ends in themselves; and 4) cognitive theories that emphasize constructs such as locus of control and self-concept that combine thought and feeling as determinants of behavior. Any such classification and definitions may be somewhat arbitrary, since each specific theory and its variants emphasize different sets of psychological constructs. The underlying constructs, moreover, may be classified in many ways; Shavelson, Hubner and Stanton (1976), for example, mention 22 review articles on self-concept alone that show 17 different conceptual categories.

Thus, one problem in applying psychological constructs of motivation to education is not in the shortage but in the surplus of theories. The practicing educator is confronted with a number of rival positions, each of which seems to have some degree of plausibility. Moreover, empirical results such as predictive validity are insufficient criteria

for adjudicating between rival constructs because of the gap between theory and empirical research. Many theories lack empirical testing in the natural settings of the classroom; much of the actual classroom research is unrelated to theories; and few studies which the present investigation uncovered compare rival theoretical propositions in classroom settings.

Even though theories of motivation are disparate and somewhat inconclusive as a set, motivation is obviously a key variable in learning. The large-scale research of the Congressionally initiated Equality of Educational Opportunity (Coleman, Campbell, Hobson, McPartland, Mood, Weinfeld, and York, 1966) showed locus of control to be the best predictor of achievement among a great number of individual, social, teacher, and school characteristics. The report reminded educators and researchers of the critical importance of motivation and related concepts of self.

Valuable research reviews of the last two decades also conclude that motivation is a critical variable and point up a number of research and educational implications. Crandall's (1963) review discusses cultural, social, parental and educational factors associated with the motivation to achieve as well as personality traits associated with educational achievement such as preferences, test-taking anxiety, personal achievement standards, and expectations. Rotter (1966) examines research on locus of control which concerns the degree to which an individual believes that rewards are contingent upon one's own behavior: internal control is the belief that reinforcements are contingent upon one's own behavior,

capacities, or attributes; external control is the belief that reinforcements are not under one's personal control but rather are under the control of powerful others, luck, chance, and fate. Lefcourt's (1976) review confirms Rotter's original theory that a person's actions can be predicted from one's values, expectations, and situations in which one finds oneself. Lefcourt cautions that perception of control is but a single expectancy construct and that people are on a locus of control continuum and change positions depending upon situations. Weiner (1976) adds the dimension of "stability" which interacts with locus of control in his attribution theory of motivation.

While there is little agreement regarding one definition of motivation, the general factor of self perception inheres in many motivation theories and measures such as self-concept, selfhood, self actualization, and self competence. Maehr (1978), Bandura (1977), Bloom (1976), Cattel (1975), and Johnson (1974) specifically point out in their work the importance of the self view as a primary correlate of learning. From this point of view the constructs of self-concept including both academic and general self-concept, achievement motivation, and locus of control were included in the analysis. Constructs such as curiosity, fear, anxiety, and task difficulty were seen as outcomes or secondary to the more basic ones involving self view and were not included in the operational definition of motivation for the analysis. Thus, the analysis draws on the prevalent conceptions that have been operationalized in samples of recent research on the association between motivation and achievement in natural settings of learning.

Method

Sample

The analysis makes use of two samples of studies with correlations between motivation and achievement measures. The first set of data, which is termed the calibration sample, consists of 122 correlations

compiled by Bloom (1976, pp 252-256) from 22 studies published between 1953 and 1974. Bloom does not explicitly describe the search and selection procedure. No systematic bias appears in the sampling; 56 of the 122 correlations in the calibration sample, however, were taken from a single large scale study of mathematics achievement by Crosswhite in 1972 (Bloom, 1976), which was taken into account in the analysis in the present paper.

The second sample of correlations, termed the validation sample,[2] was obtained from two sources. To obtain a group of studies representative of current psychological research, all studies cited in Psychological Abstracts International for 1974, 1975, and 1976 under the descriptors Motivation, Self-Concept, Self-Esteem, Internal-External Locus of Control, and Academic Achievement Motivation were scanned. In addition, to obtain a representative set of studies on a basic school subject, 1,578 studies discussed in Weintraub's (1974, 1975, 1976) "Summary of Investigations Relating to Reading" annually published in Reading Research Quarterly were searched. From these two sources, all studies were included that reported one or more Pearson product-moment correlations between any measure of motivation and any educational achievement or ability measure and that did not represent special populations, namely, juvenile delinquents, mentally or physically handicapped, the learning disabled, college students, and adults. Ability correlations were included for comparative purposes. This selection yielded 110 correlations from 18 studies.

The combined samples contain 232 correlations between motivation measures and achievement measures based on 40 studies of a total of 36,946 students. These students were in addition to the more than

498,044 represented in four correlations from the Coleman, et al. (1966) Equality of Educational Opportunity study in the calibration sample. Without the Coleman figures, the size of the samples ranged from 42 to 2,213 with a mean of 438 students and an even distribution across size.

Procedure

Although physical scientists have long quantitatively summarized numerical results across studies, until recently there were few examples in psychological research (Jones and Fiske, 1953). Recent writings of Gage, Glass and Smith, Light and Smith, and Rosenthal, however, make a persuasive case for the need and value of such synthesis in educational and psychological research (see Glass's 1978 review). The present research makes use of the techniques developed by Glass.

Twenty-seven characteristics (Table 1) were recorded for each of the 232 correlations from the 40 studies so that the analysis could reveal how the sizes of the correlations are related to the characteristics of the samples and measures. Most of these characteristics are self-explanatory, but several require explanation. Concurrent validity studies are those that obtain motivation and achievement measures roughly at the same time; predictive validity studies are those which obtained motivation measures at least three months before the achievement measures. Reliability was recorded for all motivation measures for which it was reported in the original study; unreported reliabilities were estimated at .77, the mean of the reported reliabilities from the validation sample. The mean was considered a neutral value and used so that studies that did not report reliabilities would not be deleted from the analysis; special regressions, however, were

run to test the possibility that such estimation might cause misleading results. Mathematics Self-Concept was coded separately because 56 correlations from one study of Crosswhite in 1972 (Bloom, 1976) involved this particular measure; none of the other motivation measures are specific to particular school subjects.

Results and Discussion

Table 2 shows stem-and-leaf diagrams (Tukey, 1977) of the correlations for the two samples. The first decimal place of the correlations is represented on the stem on the left of the vertical line, and the second decimal place is represented as a leaf to the right of the line; for example, the highest and lowest outlying correlations for the calibration sample are .71 and -.07. These diagrams, unlike the usual bar graphs, reveal each data point as well as the shape and irregularities of the distribution. The calibration sample reveals a slight tendency toward bimodality with peaks at about .30 and .51. The validation sample is more normally distributed but has negative correlations based on younger children in the primary grades. The validation sample also has two outlying correlations, -.31 and .98. The sources of these correlations (Cobb, 1975; Chissom and Davis, 1975; Prendergast and Binder, 1975) yield no convincing reasons for the unusual results nor for deleting the correlations, although the possibility of their undue influence on the general results was checked in the analysis.

Despite these irregularities, the central tendencies and spreads of the samples are reasonably close. The median correlation for the calibration and validation samples are .35 and .30 respectively. The

middle 50 percent of the correlations of the samples are bounded by .28 and .46 and .21 and .40, yielding comparable inter-quartile ranges of .18 and .19. The median correlation for the combined sample, .325, suggests that motivation typically "accounts" for about 10.6 percent of the variance in achievement and ability.

However, since the range of values, after liberally trimming the extreme, perhaps questionable outlying values, is at least from .10 to .60 (Table 2). The variance accounted for under partly identifiable conditions ranges from 1 to 36 percent. What characteristics of the sample and the measures account for this range of variation?

To answer this question, the correlations for the different samples and categories may be compared. This is done in two ways in the present study: once by tabulation of the means, standard deviations, and numbers of correlations for the subgroups to show how many times certain relations have been investigated (and also to introduce gradually the notion of comparison of averages of correlations, which may be unfamiliar to some readers). Because these simple comparisons do not control for the other variables investigated, however, a second method, multiple regression analysis, is employed. Regression not only controls all the independent variables for one another but presents all the significant findings in one parsimonious equation.

Uncontrolled Comparisons

Table 3 shows the results by grade level: the correlations are notably small in first grade, perhaps because of reading problems, and tend to be higher in the later grades, perhaps because of self-insight. The numbers of correlations are reasonably well distributed across grade

levels, but there are fewer at the lower grade levels, an age level that has been less frequently investigated.

Table 4 shows that the correlations are slightly lower for boys, and that girls have been somewhat less often studied. Table 5 shows that concurrent and predictive mean correlations are about the same but concurrent correlations are considerably more frequently investigated and also more variable.

Table 6 cross-classifies the two samples by motivation measure. With the exception of Academic Self-Concept in the calibration sample, the averages of the correlations across the five categories of motivation lie in the limited range of .29 to .31. The calibration sample has correlations only for Academic and Mathematics Self-Concept whereas the validation sample has a wider variety of measures. These results are due to the sampling procedures: Bloom (1976) restricted motivation to Academic Self-Concept and obtained 56 correlations from an international study of mathematics achievement carried out in a number of countries by Crosswhite in 1972. The validation sampling reflects the educational and psychological literature more broadly but also shows that recent studies have produced twice as many correlations for General Self-Concept as the other three motivation measures combined.

The achievement measures (Table 7) are broadly categorized as achievement areas, grade indices, and ability tests. The grade indices correlated the highest with motivation measures which may suggest greater accuracy on the part of the teacher in evaluating student progress and also the role of the teacher in the motivation of the student.

Regression-Controlled Results

To control the effects of the independent variables for one another, multiple regression analysis was employed (Daniel and Wood, 1971). To find a parsimonious, non-redundant model that explains the maximum amount of variance and that is not distorted by aberrant, outlying data points or studies (Walberg and Rasher, 1976), twelve regressions were run. The first includes 25 variables (all 27 variables in Table 1 except Achievement Motivation and Other Grade Index whose effects are represented in the constant term) and accounts for 40.7 percent of the variance in the correlations. The final equation includes only the eight consistently significant variables and accounts for nearly as much variance, 39.2 percent. The variables deleted make no contribution to the explained variance because they are insufficiently related to the size of the correlations or are redundant with the significant variables or both.

Several intermediate steps deleted variables at successively higher significance levels until only those at the .05 level remain. Another step showed that deleting the two outlying correlations, .98 and -.31 (Table 2) had little effect on the explained variance or the regression weights. Several steps tested the possibility of whether deleted variables that were at borderline significance at earlier steps would gain significance if entered one at a time.

Another step set the largest number of cases from the Coleman et al. (1966) research to an intermediate level of 300 to test the possibility that the apparent tendency of larger studies to produce smaller correlations is attributable only to the Coleman et al. (1966) research which has far higher sample sizes than the other studies. This was

found to be true, and the Congressionally-rushed schedule of the research and substandard administrative testing conditions account for the anomalous trend, which is not confirmed in the data from the other 39 studies. The penultimate step (discussed further below) entered the product of grade level and sex to determine if the two variables interact in the determination of the size of the correlation of motivation and achievement measures.

The final equation shows that the magnitude of the correlation between motivation and achievement is parsimoniously predicted by the following regression weights for the significant variables (all probabilities less than .05; t-values given in parentheses):

$$\begin{aligned} &.48 + .10\ (\text{Calibration Sample}) + .01\ (\text{Grade Level}) \\ &\qquad (5.30) \qquad\qquad (5.45) \\ &-.16\ (\text{Math Self-Concept}) - .06\ (\text{General Achievement}) \\ &\qquad (7.63) \qquad\qquad (2.73) \\ &+.11\ (\text{Math Grade Index}) - .15\ (\text{General IQ Test}) \\ &\qquad (3.81) \qquad\qquad (3.39) \\ &-.09\ (\text{Non Verbal IQ Test}) - .34\ (\text{Motivation Reliability}). \\ &\qquad (2.37) \qquad\qquad (3.09) \end{aligned}$$

The first weight after the constant means that, controlled for the other significant variables, the correlation for the calibration sample is .10 higher on average than in the validation sample. Table 6 shows that the two selection procedures resulted in samples that differ in the types of motivational variables investigated; the 66 correlations for Academic Self-Concept in the calibration sample which average .12 higher than in the validation sample largely explain the difference.

Grade level has a weight of .01, which means that a one-unit rise in level adds this much to the estimated correlation; for example, twelfth-grade samples, other things being equal, yield correlations .10 higher on average than second-grade samples; see Table 3 for the trend (un-controlled for the other variables). The closer linkage between motivation and achievement among older students may be attributable to their wider and longer experience in comparing their ability and performance to age peers.

Grade level is the only student characteristic that is significant; and it is notable that there is no significant difference on average between the correlations for boys and girls (see also Table 4). Some previous research indicates a possible interaction between age and sex in the determination of the relation of psychological traits and educational performance (Walberg, 1969); the association between the two may become closer with age in samples of girls than in samples of boys. To test this possibility, the product of grade level and sex was added to the eleventh equation; it was found to be non-significant but showed the same trend as the previous research. Thus, from the large number of

correlations analyzed in this research, it must be concluded that neither sex nor its interaction with grade level appear to be significant determinants of the size of the correlations, although both these possibilities warrant further research.

The next five coefficients identify characteristics of the motivation and educational outcome measures that significantly affect the correlations between them. Two of the weights reveal differences between Crosswhite's (1972) 56 correlations involving mathematics achievement and the 176 correlations from the other 39 studies: correlations involving Mathematics Self Concept are on average .16 lower, and those involving Mathematics Grade Index are .11 higher than the other correlations with the other independent variables controlled. These controlled estimates do not correspond to the uncontrolled comparisons in Tables 6 and 7 because they are adjusted for differences between the calibration and validation samples as well as the larger number of mathematics correlations obtained from high school samples. The significant differences associated with mathematics should be viewed as provisional since they are based on only a single study.

The correlations of ability and motivation were included for comparative purposes. The regression equation indicates that correlations of general ability and non-verbal ability are respectively .15 and .09 lower than for verbal ability and the achievement correlations. These findings provide support for Cattell's (1972) theoretical dimension of fluid and crystallized aptitudes: crystallized aptitudes such as verbal-educational achievement are more susceptible to internal influences such as motivation as well as external influences such as home environ-

ment and instruction.

The last weight shows that more reliable motivation measures are less closely associated with achievement than are less reliable measures.[3,4] Humphreys (1970) showed the reason for such a seemingly paradoxical finding in a general discussion of reliability assessment and factor analysis of psychological traits. Most reliabilities reported for psychological and educational tests, including those for the present samples, are indexes of internal consistency or factor purity rather than stability across occasions or forms. Because internal consistency estimation only requires one administration, it is most frequently used; indeed, item selection from pilot forms, based on correlations of items with the total test scores, a common practice, leads to uni-factorial instruments that have lower validity, that is, correlations with external criteria, because the test content is narrowed. The regression weight for the motivation reliability in the present data supports this interpretation in that an increase in the reliability across the range from the lowest to the highest value, .48 to .91, is associated with a .15 drop in the correlation between motivation and achievement.[5]

Conclusion

The mean correlation between motivation and achievement from samples of studies in psychological and educational literature is .338 (with a standard error of .009), which indicates that motivation measures on average "account" for 11.4 percent of the variance in achievement. There is considerable dispersion around the mean (Table 2), and regression yields a more precise estimate and points to the significant factors that determine the size of the correlations associated with

particular samples and measures. Perhaps the most general and useful estimates are

$$.48 - .34\ (.77) + .01\ (1) = .24 \quad \text{and}$$

$$.48 - .34\ (.77) + .01\ (12) = .35$$

for the estimated correlation from the validation sample containing more recent and representative literature, for motivation measures with the average reliability of .77, and for first- and twelfth-grade samples. These estimates are applicable to both sexes; to General Self-Concept, Academic Self-Concept, Locus of Control and Field Dependence, and Achievement Motivation; and most of the specific subject achievement measures and indexes. The exceptions to the estimates are: the correlations from the pre-1974, less-representative literature that are .10 higher on average; the lower correlations for General and Non-Verbal ability measures; and the mixed pattern for mathematics correlations that may be unique to a single large study.

Motivation measures appear to be associated with less variance in educational achievement on average than are other factors in learning which are replicable correlates; the squares of the two estimates above yield figures ranging from 5 percent in first grade to 12 percent in twelfth grade. Similarly derived and partly overlapping estimates suggest that ability is associated with about 60 percent of the achievement variance; quality of instruction, about 15 percent; amount of time spent in learning, 15 percent;

socio-psychological characteristics of the classroom group, 30 percent; and educationally-relevant aspects of the child's home environment, about 60 percent on average in elementary and secondary school samples (Note 1).

The relations among the replicable, productive factors in learning, however, appear to be multiplicatively interactive; as a consequence, any factor such as motivation that is at very low level for a particular student or group can be a potent deterrent to learning.

Although the present analysis shows that motivation measures are relatively weak correlates of learning, it also suggests that multiple or multi-factorial and hence more valid measures of motivation rather than more internally consistent or homogeneous single measures are likely to improve predictions. Because of their replicated correlations with achievement and potential for psychometric improvement, motivation measures clearly deserve inclusion in general research on classroom learning along with the other factors to determine the causal directions and weights for the factors as well as to point to the most effective ways to make learning more productive.

Reference Note

1. Walberg, H. J. A psychological theory of educational productivity. Invited paper read at the annual meeting of the American Psychological Association, September, 1978, Toronto.

Footnotes

2. The validation sample contained the following 18 studies: Chang, 1976; Cobb et al., 1975; Cole, 1974; Frymier, et al., 1975; Handel, 1975; Kagan & Zahn, 1975; Kennelly & Kinley, 1975; Lewis & Adank, 1975; Portes & Wilson, 1976; Prawat, 1976; Predergast & Binder, 1975; Primavera et al., 1974; Pugh, 1976; Schultz & Pomerantz, 1974; Simon & Simon, 1975; Stenner & Katzenmeyer, 1976; White & McConnel, 1974; White & Simmons, 1974.

3. Since achievement reliabilities are rarely reported, the reliability of the achievement measures was set at .85 for all correlations. The reliabilities of the motivation measures were taken directly from each study or were set to .77 (the mean of all the motivation reliabilities from the validation sample) in cases in which a motivation reliability was not reported. Using the appropriate reliabilities, all correlations were corrected for attenuation (Guilford, 1954, p. 400) to see how

strongly the results reported in the text would be affected after adjusting for the error of measurement. The mean correlation changed from .338 for the observed to .421 when corrected for attenuation; however, in the final regression model, the variance did not fluctuate in the first four decimal places. The b weights and t values were also similar for all variables except motivation reliability which is discussed in the text.

4. Using the Fisher Z transformation formula (Glass and Stanley, 1970, p. 265), all correlations were also adjusted for the uneven skewness which results when there is other than a normal distribution in analyses not discussed in the text. Unless a correlation is zero, skewness occurs increasingly with the higher positive or lower negative correlations. The Z transformation adjusts the raw correlation so significance tests can be applied. The mean observed correlation changed from .338 to .366 when transformed; however, in the final regression model, the variance accounted for did not fluctuate. The b weights and t values were also similar for all variables. Thus, the Z transformation does not change the essential results reported in the text.

5. Various methods were used to check whether one correlation abnormally affected the others, but the most rigorous method used to see whether one study affected the others was the Tukey jackknife (Mosteller and Tukey, 1977, p. 135). Each study was weighted based upon the number of correlations it contributed to the total 232, and then forty regressions were run eliminating each study one after the other. The results of the final jackknifed regression showed:

$$
\begin{aligned}
.31 \;+\; & .25\ (\text{Calibration Sample}) \;+\; .02\ (\text{Grade Level}) \\
& \quad (1.34) \qquad\qquad\qquad (3.09) \\
-\; & .15\ (\text{Math Self-Concept}) \;-\; .05\ (\text{General Achievement}) \\
& \quad (5.14) \qquad\qquad\qquad (1.11) \\
+\; & .11\ (\text{Math Grade Index}) \;-\; .14\ (\text{General IQ Test}) \\
& \quad (6.11) \qquad\qquad\qquad (1.90) \\
-\; & .11\ (\text{Non Verbal IQ Test}) \;-\; .00\ (\text{Motivation Reliability}). \\
& \quad (1.81) \qquad\qquad\qquad (.03)
\end{aligned}
$$

The t values for the sample and general achievement became non-significant; it could be concluded that there was no difference between the calibration sample and the validation sample. Motivation Reliability according to the Tukey method makes no difference; however, the grade level effect was strengthened from .01 to .02. Finally, except where just mentioned, all results were similar in sign, magnitude and significance as stated in the text.

Table 1

Variable List and Coding Conventions

Variable	Coding of Categorical Variables and Range of Continuous Variables
Sample	Calibration = 0, Validation = 1
Grade	1 through 12
Size of sample	42 through 200,000
Sex of sample	Male = 1, Mixed = 1.5, Female = 2
Validity	Predictive = 0, Concurrent = 1
Motivation Measure Reliability	.48 through .91
Motivation Measure Reliability Source	Reported in study = 0, Estimated = 1
Nationality	U.S. population = 0, other than U.S population = 1
Observed Correlation	-.31 through .98
Motivation Measures	(all coded: not present = 0, present = 1)
General Self-Concept	
Academic Self-Concept	
Locus of Control/ Field Dependence	
Achievement Motivation	
Mathematics Self-Concept	

Table 1 (continued)

Achievement Measures	(all coded: not present = 0, present = 1)
General Achievement Test	
Reading Achievement Test	
Math Achievement Test	
Language Achievement Test	
Other Achievement Test	
General Grade Point Average	
Math Grade Index	
Language Grade Index	
Social Studies Grade Index	
Other Grade Index	
General Ability	
Verbal Ability	
Non-Verbal Ability	

Table 2

Correlations Between Motivation and Achievement

Calibration Sample		Validation Sample	
.9		.9	8
.9		.9	
.8		.8	
.8		.8	
.7		.7	
.7	1	.7	
.6	7 7	.6	
.6	1 2 3 4 4	.6	
.5	6 8 8 9	.5	6 7
.5	0 1 1 1 1 1 1 1 1 1 2 2 3 4 4	.5	0 1 4
.4	5 5 6 6 6 6 7 8	.4	5 6 6 7 7 8 8 8 8
.4	0 0 0 1 1 1 2 2 2 2 2 3 3 4	.4	0 0 0 0 0 0 1 1 2 2 3 3 4
.3	5 5 5 5 5 6 6 7 7 7 8 9 9 9 9	.3	5 5 6 7 8 8 8 8 9 9 9 9
.3	0 0 0 0 0 0 1 1 1 2 3 3 3 3 3 3 4 4 4 4	.3	0 0 0 0 0 0 0 1 1 1 2 2 2 2 3 3 3 3 4 4 4
.2	5 5 5 6 6 6 7 7 7 7 7 8 8 8 8 9 9 9 9 9	.2	5 6 6 6 7 7 7 7 7 7 8 8 9
.2	0 0 0 1 1 2 3 3 3 3 4	.2	0 0 0 0 1 1 1 1 1 2 3 3 4 4 4
.1	5 5 6 6 9 9	.1	5 7 7 8 8 9
.1		.1	0 0 0 1 2 2 3 4
.0	7	.0	5
.0		.0	2
-.0		-.0	1 3 4
-.0		-.0	7
-.1		-.1	
-.1		-.1	
-.2		-.2	
-.2		-.2	
-.3		-.3	1
-.3		-.3	

Table 3

Correlations by Grade

Grade	Mean Correlation	Standard Deviation	Number of Correlations
1	.07	.19	9
2	.25	.14	4
3	.25	.08	15
4	.29	.07	6
5	.35	.10	27
6	.36	.12	37
7	.31	.14	40
8	.38	.09	12
9	.41	.18	26
10	.29	.08	13
11	.36	.11	19
12	.44	.18	24

Table 4

Correlations by Sex

	Mean Correlation	Standard Deviation	Number of Correlations
Males	.35	.15	66
Females	.37	.15	49
Mixed	.32	.13	117

Note: Not all samples were separated by sex.

Table 5

Correlations by Type of Validity

	Mean Correlation	Standard Deviation	Number of Correlations
Concurrent	.34	.17	145
Predictive	.34	.11	87

Table 6

Correlations by Type of Motivation Measure

Type of Motivation Measure	Mean Correlation	Standard Deviation	Number of Correlations
Calibration Sample			
General Self-Concept	--	--	--
Academic Self-Concept	.43	.14	66
Locus of Control	--	--	--
Achievement Motivation	--	--	--
Mathematics Self-Concept	.31	.08	56
			122
Validation Sample			
General Self-Concept	.29	.17	74
Academic Self-Concept	.31	.14	10
Locus of Control	.32	.13	13
Achievement Motivation	.31	.12	13
Mathematics Self-Concept	--	--	--
			110

Table 6 (continued)

Total			
General Self-Concept	.29	.17	74
Academic Self-Concept	.41	.15	76
Locus of Control	.32	.13	13
Achievement Motivation	.31	.12	13
Mathematics Self-Concept	.31	.08	56
			232

Note: The Locus of Control category also includes Field Dependence.

Table 7

Univariate Statistics of Correlations by Type of Achievement Measure

	Mean Correlation	Standard Deviation	Number of Correlations
Achievement Tests			
General	.28	.17	40
Reading	.35	.16	30
Math	.30	.09	69
Language	.28	.17	6
Other	.44	.03	4
			149
Grade Index			
Gen, G.P.A.	.45	.15	38
Math	.40	.07	18
Language	.51	.09	2
Social Studies	.50	.04	2
Other	.60	.01	2
			62

Table 7 (continued)

Ability Tests			
General	.16	.16	7
Verbal	.39	.08	5
Non Verbal	.25	.07	9
			21

References

Alschuler, A. S. Developing achievement motivation in adolescents. Englewood Cliffs: Educational Technology Publications, 1973.

Anastasi, A. Psychological testing. New York: Macmillan, 1976.

Ames, C., Ames, R., & Felker, D. W. Effects of competitive reward structure and valence of outcomes on children's achievement attributions. Journal of Educational Psychology, 1977, 69, 1-8.

Anderson, S. B., Ball, S., & Murphy, R. T. (Eds.) Encyclopedia of educational evaluation. San Francisco: Jossey-Bass, 1975.

Ball, S. (Ed.). Motivation in education. New York: Academic, 1977.

Bandura, A. Social learning theory. Englewood Cliffs, N.J.: Prentice-Hall, 1977.

Block, J. H. Motivation, evaluation and mastery learning. UCLA Educator, 1977, 19, 31-36.

Bloom, B. S. Human characteristics and school learning. New York: McGraw-Hill, 1976.

Cattell, R. & Child, D. Motivation and dynamic structure. New York: Wiley, 1975.

Chang, T. S. Self-concepts, academic achievement, and teacher's rating. Psychology in the Schools, 1976, 13, 111-113.

Cobb, P. R., Chissom, B. S. & Davis, M. W. Relationships among perceptual-motor, self-concept, and academic measures for children in kindergarten, grades one and two. Perceptual and Motor Skills, 1975, 41, 539-546.

Cole, J. L. The relationship of selected personality variables to academic achievement of average aptitude third grade. The Journal of Educational Research, 1974, 67, 329-333.

Coleman, J. S., Campbell, E. Q., Hobson, C. J., McPartland, J., Mood, A. M., Weinfeld, F. D. & York, R. L. Equality of educational opportunity. Washington, D.C.:U.S. Department of Health, Education and Welfare, 1966.

Crandall, V. Expectancy of reinforcement and academic competence. Journal of Personality, 1968, 36, 635-648.

Crandall, V. Sex differences in expectancy of intellectual and academic reinforcement. In C. P. Smith (Ed.), Achievement related motivation in children. New York: Russel Sage Foundation, 1969.

Crandall, V. J. Achievement. In Yearbook of the National Society for the Study of Education, Part 1. Chicago: University of Chicago, 1963, 416-459.

Daniel, C. & Wood, F. S. Fitting equations to data. New York: Wiley-Interscience, 1971.

de Charms, R. Enhancing motivation. New York: Wiley, 1976.

Deci, E. Intrinsic motivation. New York: Plenum, 1975.

Evans, D. R. & Hearn, M. T. Need achievement training with grade-nine students. Canadian Journal of Behavioral Science, 1975, 7, 54-59.

Freire, P. Pedagogy of the oppressed. New York: Seabury, 1968.

Frymier, J. R., Henning, M. J., Henning, W., Norris, L. & West, S. C. A longitudinal study of academic motivation. The Journal of Educational Research, 1975, 69, 63-66.

Gellerman, S. W. Motivation and productivity. New York: American Management Association, 1963.

Glaser, R. (Ed.) The nature of reinforcement. New York: Academic Press, 1971.

Glass, G. V. Integrating findings: The meta-analysis of research. In L. S. Schulman (Ed.), Review of Research in Education, Vol. 5. Itasca, Ill.: Peacock, 1978.

Glass, G. V. & Stanley, J. C. Statistical methods in education and psychology. Englewood Cliffs, N.J.: Prentice-Hall, 1970.

Guilford, J. P. Psychometric methods. New York: McGraw-Hill, 1954.

Handel, A. Attitudinal orientations and cognitive functioning among adolescents. Developmental Psychology, 1975, 11, 667-675.

Hill, K. T. & Eaton, W. O. The interaction of test anxiety and success-failure experience in determining children's arithmetic performance. Developmental Psychology, 1977, 13, 205-211.

Hill K. T. The relation of evaluative practices to test anxiety. UCLA Educator, 1977, 19, 15-21.

Humphreys, L. G. A sceptical look at the factor-pure test. In C. E. Lunneborg (Ed.) Current problems and techniques in multivariate psychology. Seattle: University of Washington Press, 1970.

Joe, V. Review of the internal-external control construct as a personality variable. Psychological Reports, 1971, 28, 619-640.

Johnson, D. J. Affective outcomes. In H. J. Walberg (Ed.), Evaluating educational performance. Berkeley: McCutchan, 1974.

Jones, L. V. & Fiske, D. W. Models for testing the significance of combined results. Psychological Bulletin, 1953, 50, 375-382.

Kagan, J. Motivational and attitudinal factors in receptivity to learning. In H. F. Clarizio, R. C. Craig & W. A. Mehrens (Eds.), Contemporary issues in educational psychology. Boston: Allyn and Bacon, 1974.

Kagan, S. & Zahn, G. L. Field dependence and the school achievement gap between Anglo-American and Mexican-American children. Journal of Educational Psychology, 1975, 67, No. 5, 643-650.

Kennelly, K., & Kinely, S. Perceived contingency of teacher administered reinforcements and academic perfcrmance of boys. Psychology in the Schools, 1975, 12, 449-453.

Lefcourt, H. M. Locus of control. Hillsdale, N.J.: Erlbaum, 1976.

Leviton, H. The implications of the relationship between self-concept and academic achievement. Child Study Journal, 1975, 5, 25-35.

Lewis, J. & Adank, R. Intercorrelations among measures of intelligence, achievement, self-esteem and anxiety in two groups of elementary school pupils exposed to two different models of instruction. Educational and Psychological Measurement, 1975, 35, 499-501.

Maehr, M. L. & Sjogren, D. D. Atkinson's theory of achievement motivation: First step toward a theory of academic motivation. Review of Educational Research,1971, 41, 143-161.

Maehr, M. L. Culture and achievement motivation. American Psychologist, 1974, 29, 887-902.

Maehr, M. L. & Stallings, W. M. (Eds.) Culture, child and school. Monterey: Brooks—Cole, 1975.

Maehr, M. L. Continuing motivation: An analysis of a seldom considered educational outcome. Review of Educational Research, 1976, 46, 443-462.

Maehr, M. L. Turning the fun of school into the drudgery of work: The negative effects of certain grading practices on motivation. UCLA Educator. 1977, 19, 10-14.

Maehr, M. L. Sociocultural origins of achievement motivation. In D. Bar-Tal & L. Saxe (Eds.) Social Psychology of Education: Theory and Research. New York: Hemisphere, 1978.

Marjoribanks, K. School attitudes, cognitive ability and academic achievement. Journal of Educational Psychology, 1976, 68, 653-660.

Mosteller, F. & Tukey, J.W. Data analysis and regression. Reading, Mass.: Addison Wesley, 1977.

Portes, A. & Wilson, K. L. Black-white differences in educational attainment. American Sociological Review, 1976, 41, 414-431.

Prawat, R. S. Mapping the affective domain in young adolescents. Journal of Educational Psychology, 1976, 68, 566-572.

Prendergast, M. A. & Binder, D. M. Relationships of selected self-concept and academic achievement measures. Measurement and Evaluation in Guidance, 1975, 8, 92-95.

Primavera, L. H., Simon, W. E. & Primavera, A. M. The relationship between self-esteem and academic achievement: An investigation of sex differences. Psychology in the Schools, 1974, 11, 213-216.

Pugh, M. D. Statistical assumptions and social reality: A critical analysis of achievement models. Sociology of Education, 1976, 49, 34-40.

Robinson, J. P. & Shaver, P. R. Measures of social psychological attitudes. Ann Arbor: Institute for Social Research, University of Michigan, 1976.

Rotter, J. Generalized expectancies for internal versus external control or reinforcement. Psychological Monographs, 1966, 80, No. 609.

Ruebush, B. K. Anxiety. In H. W. Stevenson, J. Kagan & C. Spiker (Eds.), The sixty-second yearbook of the National Society for the Study of Education. Chicago: University of Chicago Press, 1963.

Salili, F., Maehr, M. & Gilmore, G. Achievement and morality: A cross cultural analysis of causal attribution and evaluation. Journal of Personality and Social Psychology, 1976, 33, 327-337.

Schultz, C. B. & Pomerantz, M. Some problems in the application of achievement motivation to education: The assessment of motive to succeed and probability of success. The Journal of Educational Psychology, 1974, 66, 599-608.

Sears, P. S. Evaluation and motivation: A critical review. UCLA Educator, 1977, 19, 26-30.

Shavelson, R. J., Hubner, J. J. & Stanton, G. C. Self-concept validation on construct interpretations. Review of Educational Research, 1976, 46, 407-441.

Simon, W. E. & Simon, M. C. Self-esteem, intelligence and standardized academic achievement. Psychology in the Schools, 1975, 97-100.

Smith, R. L. & Troth, W. A. Achievement motivation: A rational approach to psychological education. Journal of Counseling Psychology, 1975, 22, 500-504.

Stenner, A. J. & Katzenmeyer, W. G. Self-concept, ability and achievement in a sample of sixth grade students. The Journal of Educational Research, 1976, 69, 270-273.

Thorndike, R. L. (Ed.) Educational measurement. Washington, D.C.: American Council on Education, 1971.

Tukey, J. W. Exploratory data analysis. Reading, Mass: Addison-Wesley, 1977.

Walberg, H. J. Physics, femininity and creativity. Developmental Psychology, 1969, 1, 47-54.

Walberg, H. J. & Rasher, S. P. Improving regression models. Journal of Educational Statistics, 1976, 1, 253-277.

Warren, J. R. Evaluation, motivation and grading. UCLA Educator, 1977, 19, 22-25.

Weiner, B. Motivation. In R. Ebel (Ed.), Encyclopedia of Educational Research, New York: Macmillan, 1969.

Weiner, B. Achievement motivation and attribution theory. Morristown, N.J.: General Learning Press, 1974.

Weiner, B. An attributional approach for educational psychology. In L.S. Shulman, (Ed.), Review of Research in Education, Vol. 4. Itasca, Ill.: Peacock, 1976.

Weiner, B. Psycho-social determinants of achievement evaluation. UCLA Educator, 1977, 19, 5-9.

Wells, L. E. & Marwell, G. Self-esteem. Beverly Hills: SAGE Publications, 1976.

Weintraub, S., Robinson, H. M., Smith, H. K., Plessas, G. P., & Rowls, M. Summary of investigations relating to reading, July 1973 to June 1974. Reading Research Quarterly, 1974-1975, X.

Weintraub, S., Robinson, H. M., Smith, H. K., Plessas, G. P., Roser, N. L. & Rowls, M. Summary of investigations relating to reading, July 1974 to June 1975. Reading Research Quarterly, 1975-1976, XI.

Weintraub, S., Robinson, H. M., Smith, H. K., Plessas, G. P., & Rowls, M. Summary of investigations relating to reading, July 1975 to June 1976. Reading Research Quarterly, 1976-1977, XII.

White, W. F. & McConnel, J. Affective responses and school achievement among eighth grade boys and girls. Perceptual and Motor Skills, 1974, 38, 1295-1301.

White, W. F. & Simmons, M. First grade readiness predicted by teachers perception of students maturity and students perception of self. Perceptual and Motor Skills, 1974, 39, 395-399.

Wood, F. S. & Daniel, C. Fitting equations to data. New York: Wiley-Interscience, 1971.

Wylie, R. C. The self-concept. Lincoln, Nebraska: University of Nebraska Press, 1974.